



Topical Fire Research Series

January 2001/
Rev. December 2001

Vol. 1, Issue 9

Federal Emergency
Management Agency
United States Fire
Administration
National Fire Data Center
Emmitsburg, Maryland
21727

OTHER RESEARCH TOPICS OF INTEREST

*Portable Heating Fires in
Residential Structures*, Vol.
1, Issue 10, January 2001

Halloween Fires, Vol. 1,
Issue 1, October 2000

*Christmas/Christmas Tree
Fires*, Vol. 1, Issue 4,
November 2000

The Danger of Fireworks,
Vol. 1, Issue 7, January 2001

Winter Residential Fires,
Vol. 1, Issue 13, February
2001

*Candle Fires in Residential
Structures*, Vol. 1, Issue 12,
February 2001

Grill Fires, Vol. 2, Issue 3,
July 2001

*Residential Air Conditioning
Fires*, Vol. 2, Issue 5, July
2001

To request additional informa-
tion, or to comment on this
paper, visit

[http://www.usfa.fema.gov/
feedback/](http://www.usfa.fema.gov/feedback/)

Heating Fires in Residential Structures

FINDINGS

- Since 1984, heating fires have decreased fourfold, primarily because the 1980s surge in the use of space heaters and wood burning has abated.
- Heating fires are the leading cause of fires in rural areas of the country. They represent the second leading cause of all residential fires (behind cooking fires).
- More than half of residential heating fires are due to mechanical failure. In one- and two-family residences, one-third of heating fires results from improper maintenance of heating equipment.

Each year in the United States, an average of 48,300 heating fires occur in residential structures, which are responsible for 320 civilian fire deaths, 1,300 injuries, and \$450.8 million in property loss.¹ This topical report examines the causes and characteristics of residential heating fires.

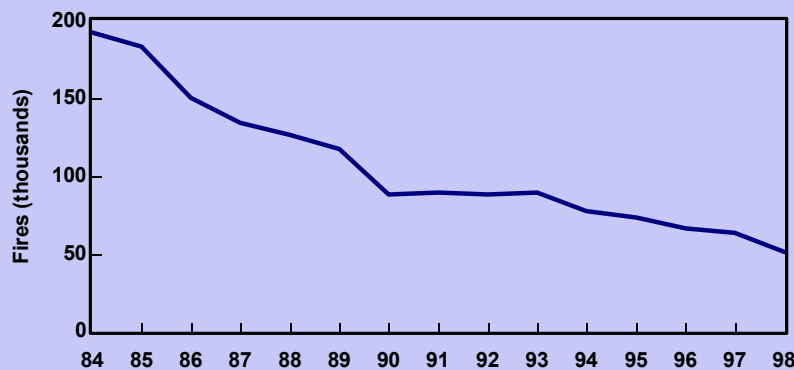
Data from the National Fire Incident Reporting System (NFIRS) (1996–1998) show losses from heating fires are higher than those averaged across all fires (Figure 1). Heating is second only to cooking as the leading cause of residential structure fires. In the late

1970s and early 1980s, heating was actually the leading cause due to a surge in the use of alternative space heaters and wood heating. This surge was in large part stimulated by an energy shortage and environmental concerns. The overall number of fires in the nation has decreased over the last 15 years, but while other categories of fires (e.g., cooking) have held steady or declined slightly, the incidence of heating fires has decreased dramatically over the last decade (Figure 2). In 1983, there were nearly 200,000 such fires;² by 1998 that number had fallen to approximately 50,000.³

Figure 1. Loss Measures in Residential Structures
(3-year average (1996–98) from NFIRS data)

MEASURE	ALL RESIDENTIAL FIRES	RESIDENTIAL HEATING FIRES
Dollar Loss/Fire	\$11,271	\$9,179
Injuries/1,000 Fires	48.0	28.9
Fatalities/1,000 Fires	7.7	5.7

Figure 2. 15-Year National Trend in Heating Fires in Residential Structures
(NFIRS data and NFPA Annual Surveys, 1984–98)



EQUIPMENT INVOLVED IN HEATING FIRES

The term *heating fires* applies to those fires that are caused by functioning or malfunctioning central heating units, fixed or portable local heating units, fireplaces, chimneys, and water heaters. Figure 3 illustrates the leading types of equipment involved in these fires.

TIME OF YEAR

Figure 4 shows the pattern of heating fires throughout a year. As would be expected, the number of heating fires increases during the late fall and winter months (November through March) when people increase their use of central heating systems, portable heaters, and fireplaces. The peak months for residential heating fires are January and February, with a decline through the remainder of the winter season. Despite the increased use of heating equipment, heating fires still remain the second leading cause (behind cooking) of residential structure fires in the fall and winter months.

The equipment involved in heating fires varies by area of the country. In the South, chimneys cause more heating fires than central heating systems, while the

opposite is true in the North. Given climatic differences, fewer southern homes may have central heating systems than those in the North, and southerners are more likely to rely on fireplaces and other heat sources.⁴

WHAT IS IGNITED?

The leading *forms* of material ignited in heating fires are rubbish and other trash, structural framing, electrical wire, and fuel (Figure 5). There are variations, however, depending on the particular heating equipment involved. For example, fires involving portable heaters (the subject of another topical report) are more likely to

involve bedding than other heating sources; more than half of chimney fires involve the ignition of rubbish or trash.

The leading *types* of materials first ignited are resin/tar, sawn wood, fabric, and combustible liquids such as kerosene, fuel oil, and diesel fuel. Again, there are variations depending on the type of heating equipment involved in the fire. For example, the leading type of material ignited in fires involving fireplaces is sawn wood. But the leading type of material ignited in chimney fires is resin/tar, known as creosote, which is a natural byproduct of burning wood. (Anecdotal evidence suggests that firefighters may report to NFIRS that creosote in chimneys is caused by waste/rubbish, thereby explaining the prevalence waste/rubbish as the type of material ignited.)

WHAT IGNITES THE FIRE?

As illustrated by Figure 6, 58% of all heating fires are attributed to some form of mechanical failure. Of those fires caused by some kind of mechanical failure, 32% are caused specifically by improperly maintained equipment. Combustibles placed too close to a

Figure 3. Leading Equipment Involved in Heating Fires
(residential structures, adjusted %, 3-year average (1996–98) from NFIRS data)

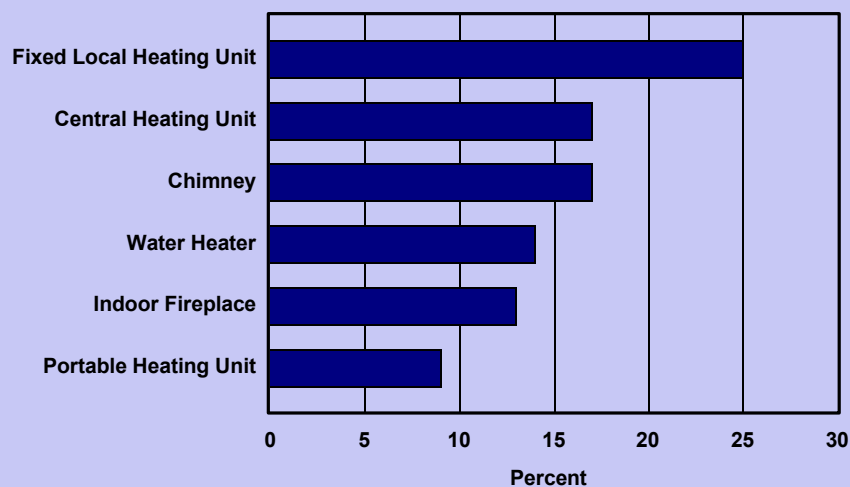
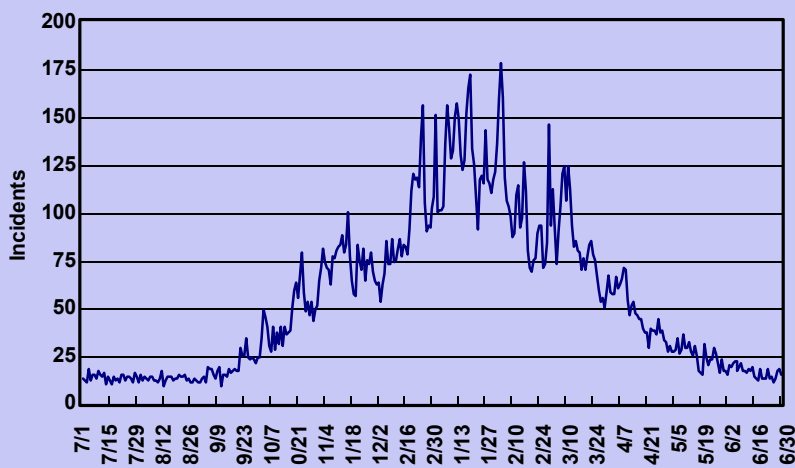
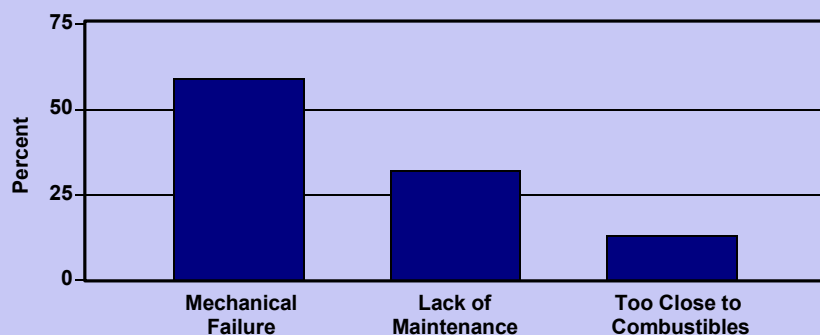


Figure 4. Heating Fires(residential structures, adjusted %, 3-year average (1996–98)
from NFIRS data)**Figure 5. Material Ignited in Heating Fires**(residential structures, adjusted %, 3-year average (1996–98)
from NFIRS data)

TYPE	PERCENT	FORM	PERCENT
Resin/Tar	28	Rubbish/Trash	28
Sawn Wood	18	Structural Framing	13
Combustible Liquids	6	Fuel	10
Fabric	8	Electrical Wire	8

Figure 6. Leading Ignition Factors in Residential Heating Fires(residential structures, adjusted %, 3-year average (1996–98)
from NFIRS data)

heating source cause an additional 13% of heating fires.

Although nearly half of all heating fires involves some kind of mechanical failure, the reason for that failure varies depending on the type of residential property in-

involved in the fire. In one- and two-family residences, nearly one-third of heating fires is due to improper maintenance. In contrast, only 10% of heating fires in apartments results from a lack of proper maintenance; apartment fires are more likely to be caused by a short

circuit or part failure.⁵ This variance may be because apartment complexes generally contract out heating system maintenance or assign that responsibility to in-house facilities maintenance personnel. Homeowners, on the other hand, are entirely responsible for either undertaking this maintenance or ensuring it is done by others.

CIVILIAN FATALITIES

Heating is the third leading cause of civilian fire deaths, following smoking and arson. When analyzed further, however, heating fires in residential structures are the leading cause of fire deaths in *rural* areas and are not a leading cause of fatalities in *urban* areas. This disparity may be due to the prevalence of central heating systems and apartments in urban areas.⁶

ALTERNATIVE HEAT SOURCES

Some fires are not necessarily coded as heating fires. A deadly phenomenon is that of fires caused when people use alternative sources of heat (such as a stove) to keep warm. In one such fire, a gas stove was turned on to help heat a Baltimore home. The flames from the burners ignited items in the kitchen, sparking a fire that killed four members of a family, including a 5-year old child.⁷ This practice may be more common in impoverished areas where people may not be able to afford heating fuel and instead rely on space heaters or even open fires to heat their homes. In addition to posing a potential fire hazard, these practices can lead to the accumulation of dangerous carbon monoxide fumes, which are as deadly as fire.

To review the detailed methodology used in this analysis, click [METHODOLOGY](#)

Footnotes:

1. National estimates are based on National Fire Incident Reporting System data (1996–1998) and the National Fire Protection Association’s (NFPA) annual survey, *Fire Loss in the United States*.
2. *Fire in the United States 1983–1990*, Eighth Edition, U.S. Fire Administration, Federal Emergency Management Agency, 1991.
3. NFIRS, 1998 data.
4. *The Rural Fire Problem in the United States*, U.S. Fire Administration, Federal Emergency Management Agency, 1998.
5. NFIRS analysis, 1998 data.
6. *Profile of the Urban Fire Problem in the United States*, U.S. Fire Administration, Federal Emergency Management Agency, 1999.
7. “Family Tragedy, Four Killed in Fire,” *The Baltimore Sun*, January 20, 1997.